

Augmenting Digital Audio Broadcast with Rich Data

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ABSTRACT

HP Laboratories, GWR, Bristol University, ASL and Panasonic Semiconductor are collaborating to explore the potential of Digital Audio Broadcasting through a series of user trials. Our first iPAQ-based prototype allows listeners to GWR-Bristol to interact with a set of web pages broadcast alongside the digital audio stream and displayed on a small color display. In a hands-on study, typical GWR listeners responded very positively to the experience of viewing web pages on a visual radio. Local news, weather forecasts, event listings, and details of the last ten songs broadcast proved especially popular. In forthcoming experiments, we will begin to explore the additional value of a wireless backchannel enabling listeners to interact directly with the broadcaster.

Categories and Subject Descriptors

B4.1 [Input/Output and Data Communications]: *Receivers, transmitter*. H5.2 [User Interfaces]: *GUI, Interaction styles, prototyping*.

Keywords

Digital Audio Broadcast, Digital Entertainment, Visual Radio, Lifestyle Research, Radio Listening.

1. INTRODUCTION

Digital Audio Broadcasting (DAB) is an initiative to broadcast audio *and* data in digital rather than analogue form traditionally used by radio stations [5]. Over 300 million people around the world can, in principle, receive DAB. Key countries include the UK, Germany, Australia and Canada. Wide scale deployment of DAB in China, Korea and India brings important momentum to the DAB roll-out [10].

DAB transmission consists of different audio and data services, collectively known as an “ensemble”, with a capacity of approximately 1.15Mbits/s (assuming error protection level 3), shared by the audio and data services within it. Multiple ensembles can be broadcast side-by side on different frequencies. An audio service is an MPEG encoded audio stream, typically

between 64 Kbits/s for voice and 128 Kbits/s for stereo music. Associated with an audio service is the Dynamic Label Service (DLS) containing 128 characters of text that appear on the digital radio’s small screen and is updated every few seconds, to show for instance what is coming up next, traffic reports etc.

The Multimedia Object Transfer protocol (MOT) enables broadcasting other digital data (images, html, sounds, etc) via DAB that may, but need not, be associated with the broadcast audio. The data rate for a data service can be set anywhere between 8 Kbits/s to a maximum of 384 Kbits/s. MOT works in a “carousel” style, similar to “Teletext”; if part of a file is missed, due to interference, the radio waits for the next turn of the carousel when it will be re-broadcast. The frequency with which files are broadcast can be fine tuned by the radio station, allowing a pre-emptive caching strategy, in order to give priority to data that are relevant to the user right now, while still broadcasting content for the future at a lower rate. In other words, the digital radio can be primed with relevant content ahead of time.

A range of existing products feature DAB radios with its small display for the (scrolling) DLS text: dedicated DAB radios, alarm clocks, MP3 players, and so on. The UK saw record breaking sales of DAB radios in 2003 and 2004 [3, 4]. However, adding richer visual data to the audio stream necessitates a bigger display than is currently implemented and would require a considerable investment by the manufacturers of DAB radios.

Our research collaboration, between Hewlett Packard Laboratories, GWR-Bristol, Bristol University, the Appliance Studio and Panasonic Semiconductor, focuses on local radio and the aim is to explore the potential of augmented DAB through a series of user trials. GWR owns 35 local radio stations across the U.K., amongst which GWR-Bristol. Our first iPAQ-based, prototype allows GWR-Bristol listeners to interact with a set of web pages broadcast alongside the digital audio stream and displayed on the handheld’s small color display, taking up an additional 96 Kbits/s of the available bandwidth.

The research program envisages that some of the DAB radio channels in the near future will be accompanied by richer visual data, most likely displayed on a small screen and allowing some sort of interactivity between audience and broadcaster. The interactivity in certain cases will be informed by the GPS location of a user. The user studies part will address how combinations of these five elements (radio, data, small screen, interactivity and location) could lead to a compelling user experience.

DAB might not be the only delivery mechanism for such extended radio services. The Nokia and HP collaboration in the “Visual radio” venture is an example of how an FM radio station, Kiss FM in Helsinki in this case, might be accompanied by visual

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information about the music that is on air, providing some sort of interactivity, where for instance people can vote for a song or play games whilst listening to the radio [12].

There is an interesting tension between being mostly a single listener and GWR being a local community radio station. Paddy Scannel [11] addresses this phenomenon of how broadcast media such as radio, TV or even broad-sheets and internet, communicate to their listeners, viewers, readers in their masses whilst at the same time address them as individuals. He calls this particular communicative structure a “For-Anyone-as-Someone” structure. “For-Anyone” structures relate to mass produced, impersonal products such as a toaster, whereas “For Someone” structures relate to made-to-measure objects, like glasses or dentures, not useful for anyone but the person it is made for. In terms of communicative aspects, the manual for the toaster is a “For Anyone” communicative structure and a letter written by a friend especially to me is a “For Someone” communicative structure. Radio, then, combines both these notions as on the one hand broadcast is sent out to the millions whilst at the same time it speaks to individuals:

“Thus it is an intermediary structure that mediates between the impersonal for anyone structure and the personal for-someone structure. As such the for-anyone-as-someone structure expresses and embodies that which is between the impersonal third person and the personal first person, namely the second person (the me-and-you). The for-anyone-as-someone structure expresses ‘witness’. It articulates human social life.”[11]

This “For-Anyone-as-Someone” structure also benefits from the community feel that local radio evokes. Adding richer data, in particular local information and enabling interaction to the digital audio broadcast, could then further emphasize such communicative structures. The question then is: What would prompt people to glance at their device, make them dip in (and out) of visuals that accompany radio broadcast? Could the visual aspects protect, consolidate or even increase the share of listeners?

2. METHOD

2.1 Prototype and interface



Fig. 1 Prototype

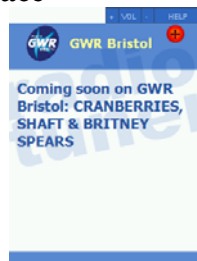


Fig. 2 Interface

The prototype (fig. 1) consisted of an iPAQ (with PocketPC2003 as operating system), model 5450, with a PCMCIA DAB receiver (developed by GWR Bristol). The MOT decoding software library was provided by Panasonic Semiconductor. The software and hardware integration of the various components was written in C++.

When tuned in into GWR, the accompanying and regularly updated DLS text was displayed as a non-scrolling text (fig. 2). A

volume up and down button, the GWR logo as well as the “Radio Plus” (top right) button were shown. The “Radio Plus” button opened up HTML pages with national and local news, sports and entertainment and the five day weather forecast. A listener could also see a list of the last ten records that were played.

2.2 Subjects and procedure

Twenty GWR listeners took part, 12 women, mean age 29 years and eight men, mean age 31 years. Three participants still lived at home, three shared a house, two lived alone, five cohabited, two lived with a partner and expected their first baby and five had a family with one or more children. All owned a mobile phone and regularly accessed the internet.

Subjects were asked to describe their radio listening habits for a typical week day. Following on, the prototype was shown and subjects were offered an opportunity to listen to GWR’s radio broadcast and see the DLS. Then, we pointed out the “Radio Plus” button and subjects were invited to hold the prototype themselves and explore the GWR-Bristol internet pages. In this manner, we aimed to collect information on participants’ lifestyles, how they experience radio and how a product similar to our prototype might fit into their lives. All sessions were recorded onto video tape and later transcribed.

3. RESULTS

3.1 Current radio listening habits

For half of the sample the radio is switched on first thing in the morning. Four of them have a radio alarm clock: *“I have a radio on my alarm and then I lay in bed and listen to the radio for about 15 minutes, and I’ll try to set it so that I catch the first news bulletin, if I get up at seven I set it for quarter to, listen to the news bulletin and then I’ll get up.”* A further five start listening in the car and the rest starts listening at work or at home. All in all, there are 15 who listen in the morning before 9AM.

After waking up, the radio is on during breakfast, whilst in the bathroom, when they get dressed and driving to and from work: *“In the bathroom there’s a radio as well, so I can hear the traffic reports and listen to music while I’m getting ready, and then on the drive into work and when I drive home I listen to the radio.”*

The radio is on during working hours as well. This could be because the radio is on at work for all to hear or enjoyed privately on headphones by individuals via the internet. In addition, those who look after children describe how radio cuts down on too much television watching, bringing the family together around the table, providing a warm atmosphere: *“The kids like to watch TV, but I don’t want them to watch TV too much so I tend to put some music on. If you put a CD on, you have to keep skipping through the songs if you don’t want to listen to the whole album. So I put the radio on because it is background and the children tend to come into the dining room then and do some drawing. They like to have music in the background.”*

Although evenings are *the* time for TV watching, there are some who listen to the radio then because of specific interests and for two, the radio is there to fall asleep by.

Radio waves are received in the house in a great many forms and guises. There are old-fashioned dial radios, alarm clocks, stereos with presets, broadband TV (cable, and satellite), Internet, DVDs with radio in and DAB radios. The house seems to be full of radio

appliances and people are happy to move through the house switching radios on when entering rooms and off when leaving a room or simply not bothering to switch it off at all: *"My mum has got one in the kitchen, she's got that on all the time, even when she's not there, it's on, she puts it on for the dog."* Satellite and cable TV also provide digital radio and occasionally this allows some participants to tune into local radio stations far away from their actual locality, for reasons of nostalgia: *"I listen to my radio station [On satellite TV] which I remember from my days in London, Heart FM."*

On the mobile radio side there is first and foremost the car radio with its presets. It breaks the monotony as well as the silence. There are several comments highlighting that the car-radio is there for lightweight (musical) company. A few sing along to their hearts content. The car is also a place from which to watch (and be part of) other drivers listening to the radio: *"I can't stand being in a quiet car. --- In the car it is for company, it is something there. I do find myself singing along, laughing in my car, so I think people must be staring at me so I stare at them when they do it, but I do enjoy it, and yesterday, in the car next to me and they were singing along with the radio."* Of course local traffic information is important: *"The traffic reports, especially if they are accurate and local stations will give more relevant information about the area."*

Most interviewees listen to the radio whilst traveling to work and they tend to stick to one station. When traveling back from work they are more inclined to flick over, as the adverts start to annoy them but they will usually flick back to their main station: *"If the adverts starts to annoy me I will switch, but I will switch back. Quite quick, because they are preset."*

Those who travel more extensively for work during the week or in the weekend for private reasons, mention how they try to go from one local radio station to another: *"Trips I do frequently, like Bristol to London I can tell you GWR at junction 16 disappears, you can pick up GWR for Swindon, and you can take that to the Membury services and then you can pick up Heart, I am more of a fan of local radio."*

When they are tired of flicking and when reception gets poor, people tend to put on CD's, but by and large radio is preferred as it is less hassle and, when traveling with others, radio finds a happy medium between diverse tastes: *"I usually listen to the radio, the CDs in the car are mostly my husband's CDs and we have a different taste. The radio is a common ground."*

Mobile radio is also enjoyed by some through their phone with FM radio: *"My Nokia mobile's got the radio on, put my headphones on and listen through that. I used it a lot when I was bussing it a lot. I use it now if I'm walking around local and don't really need to use the car."* There are one or two people who use a dedicated mobile radio but there are more who mention that they have one and don't use it anymore.

Most interviewees love interacting with radio and TV. Interaction can take several forms, ranging from playing along with a game in one's head, shouting at the radio even (or especially) when by your self, texting (sending an SMS), phoning in, internet interaction and pressing the red interaction button on the remote

control of the digital TV: *"Oh yes, definitely, sure I do that, Bush and Troy do a quiz, about ten past eight, and I'll invariably be yelling at the radio."*

The context may be a quiz, voting for e.g. Big Brother, requesting a song or even making a complaint. The intensity of the experience might be related to the strong community feel that local radio evokes. There can be frustration or sheer delight but always there are "other people", on the radio, in the office playing along, or talking about it: *"My mum has, she was on GWR with Secret Sound. She was almost on the border of obsession, she used to phone all the time --- I really enjoyed that. When my mum started taking an interest in it, when people around you are taking more of an interest in it, you tend to listen to it more. And I did used to actually switch on at these certain times of the day, basically just to listen out to see if there was anybody on it that I knew. Because I knew a lot of my family was trying to phone in."*

On a more prosaic note, a chance to win money is definitely a strong incentive. Feedback about how the rest of the local people (or nation at times) voted, answered a question is well received, reinforcing that community spirit: *"I log on to GWR, I'll click the 'listen here', whilst that's buffering, I scan that first page for anything that takes my interest, and then I'll vote on the daily vote because I want to see what everybody else has voted on."*

People are acutely aware (sometimes after a bad experience) of the cost of voting: *"I did once with GWR, I entered that Secret Sound, for about three days it was driving me mad because I knew what the sound was and I just could not get through and I phoned and phoned and phoned and I could not get through, and it went on for a week and I kept phoning every day, and unbeknown to me every time I phoned it would be costing 50 P and they did not actually say that--- and the bill came to about twenty seven pounds. --- I won't ever do that again, it was to win 5000 pounds. I did have the right answer and it was really annoying."*

Phoning in has several drawbacks. It is perceived as expensive, you even pay when you are in the queue to register for an interaction, people do not always want to hear themselves talking on the radio, there is very little chance of actually getting through and it is far from immediate; by the time you are able to cast your vote, give your answer, you may well be in the car to work: *"When you enter a competition you have to play in 15 minutes by which time I'm driving."* There also seems to be a gender difference with more men commenting how they will not take part, or rather, how they will not part with their money.

There is a clear preference for texting, not necessarily because it is cheaper but for most it is more convenient, they are already in the habit of texting: *"I prefer texting through habit, I text my friends, I don't think it is cheaper."* On the other hand one interviewee mentions that with texting you never know whether the text has reached the program makers.

There were many comments about what (local) presenters and information about people's locality mean to our sample. Most of our interviewees listen to the radio in the morning; it sets them up for the day. For this morning show the chemistry between the presenters, Bush and Troy in the GWR case, is of utmost importance and although they do like the music as well, this does

not seem to be the main reason to tune in. People identify with presenters, are very loyal to them, they feel they know them. These presenters speak to the heart: *“Especially I like listening first thing in the morning to the Bush and Troy show mostly --- I don’t know I think it’s that they’re just so stupid, it’s really a stupid sense of humor and it all relates to local areas and local people and things like that, it’s just easy listening, plus you don’t have to think about that, but it makes you laugh as well, and it’s an entertaining thing as well --- it’s sort of on the ball, and everybody who phones in they just take the ‘Mick’ out of them. Sometimes you hear them going to pieces and they say: I don’t know what I gotta say next now. And I like that angle. They work well together, it’s that combination of people together for a show. --- It’s local stories as well, such and such has happened you think oh I know where that is, that’s my story, you can relate to that, yeah, I know, I’ve been there, I know what they’re talking about.--- It’s almost you’re listening to some of these conversations, it’s the nosy neighbor within coming out, so you think oooh, well really? [laughs]. I can completely interact to some extent and keep my distance.--- [phoning in] I heard myself a few weeks ago and I thought I sound like all those people I take the ‘Mick’ out of, my really broad Bristolian accent. At the same time, I know, they’re just like me, they’re listening to the radio station in the car, there was a bit of a delay and they played it, my friend phoned me up oooh I heard you on the radio and my mum said I don’t believe you spoke like that, really broad Bristolian.”*

As much as they know who they like (and what time they are on), at the same time, people know who they don’t like: *“They are really annoying and obnoxious like Chris Moyles and Sara Cox. Their tone of voice, their cocky attitude, their kind of, don’t know, just an annoying personality --- wouldn’t get along with them in real life either.”*

The participants say that through GWR they become aware of up and coming local events. Local events are also mentioned later in the day as talking points at work or with family and occasionally there are upsetting topics in these morning shows, e.g. a fatal traffic accident: *“Especially like local events, I tend to discuss those, or with my partner, when I get home, like with the Red Hot Chili peppers concert in Cardiff, that was one, because they originally were just going to London and Manchester and then they added Cardiff and I only found out about it by listening to the radio and we booked tickets. --- And when there was a road accident and two people died.”*

There were a great number of spontaneous comments about adverts. Mainly, as can be expected, about how annoying they are and how they are a reason to flick channels, but someone adds that adverts per se are not the reason, it is the annoying ones. Although our sample flicks when adverts start, they also seem to have a fair idea of how long adverts last and will flick back when they think they are over: *“One pet hate is adverts. So I probably listen to the first 30 seconds and then when I’m in a position to flip channels, I will, If I’m in the car I will flick to another channel, but I will probably flick back, I have a fair idea how long it is going to last, so I’ll be back to the presenter talking”*

Adverts can put you off, but there is an awareness suggesting that, really, advertising can be very useful: *“They do local*

advertisements for local companies which can be quite interesting even though it can be annoying.”

3.2 Reactions to prototype

For most it was the first time they saw a DLS text and some expressed their disbelief, marveling at the magic of this technology. People liked to see what is playing now and which songs are coming up. It would even keep them tuned in longer and wait for the adverts to finish: *“Does this say what plays at the moment? So it tells you what it is playing next as well? No way!!! That is good. I like that a lot.”* In addition, you would have more time to prepare to record a song.

Pressing the “Radio Plus” button leads them to GWR’s handheld, bespoke website, showing information on the local, national and international news, the five day weather, movies, music and the last ten songs played: *“Like a mini web site.”*

Currently, the interviewees consult a number of sources for weather information. They listen to the radio or watch the TV, although there is the downside (for those of an impatient nature) that you have to tune in at a particular time. Seven, indeed, point out the convenience of looking up the weather on the internet, where you are not bound to particular timeslots, although it often does mean starting up the computer: *“For weather I rely on the television more than on the radio or we might use the computer sometimes for the weather or the traffic when we go down to the coast. On the computer, it is there when you want it rather than that you have to wait for a certain time slot.”*

The reason for finding out about the weather is often to do with planning days out in the weekend. But there are other reasons: *“The weather is vital in the morning. What am I going to wear?”* When shown the five day forecast weather button, the reactions are unanimously positive, even enthusiastic, leading to exclamations such as: *“THE WEATHER!!!! That IS good.”*

They all compare the DAB information, such as the five day forecast, to the internet, but with important added advantages: it’s mobile, simple and it does not require booting up. Receiving this information effortlessly as part of the radio broadcast in a lightweight, one click, fashion is a potential big user value: *“And you can read it any time you want to. You don’t have to walk up to your computer and turn it on. It has the weather.”*

The majority of the sample enjoys movies and they go to the cinema regularly. They do like the “What’s on” section on the GWR website. Again, accessing this information in this fashion has advantages over listening out for it on the radio or to start up a computer and going to the internet. Regularly they remark that to know where and at what time a movie is shown *and* a way to order cinema tickets via the device would be very useful. It provides evidence that there is some mileage in converting those buying impulses, making sure they are not lost: *“It would be fantastic if they can tell you where and what times it is on, --- book tickets on the credit card. I would use that on this as well.”* Providing little tasters, in the form of short trailers, could help with this.

There are other location specific comments, e.g. how a product like our prototype might link up with the satellite navigation

system in the car. Local does not always mean the place of residence, i.e. Bristol. As people travel around they would like to know what is on in other local areas, including local traffic information: *“What would happen then, say if you got it in the car and you just travel up North, what would happen to all the information, would it just switch to the local one up there? If I had it in my car --- because I’m probably going to get my self a navigation system, so if I set it up to pick up that kind of, if that program was on there.”*

The website displayed the last ten songs that were played on GWR-Bristol. There was a recognition of how useful this would be, in particular if accompanied by extra information: *“I hate it sometimes if you hear a new song and you really liked it and they already said it who it is or you missed the bit where they said who it was, that would be really handy, so I could look it up on here --- I don’t buy singles anymore, mostly buy albums, so if I heard one song by somebody if I hear a second that I like I might buy the album, that would be a good way of finding out more, because there is so much on the market these days, you can’t know them all. That would also be a good way of finding out if they are doing any concerts, if they could tell you the most local concert to you, tell you the date.”*

This service would open up possibilities for interaction. For instance being able to play a song again, vote for a song, or give GWR feedback about their play list. Buying (impulse or not) could also be facilitated in this fashion, as most expressed the wish to be able to order, buy a song or an album, via the GWR interface or download some MP3’s: *“The last 10 is brilliant, because you can buy tunes individually now.”*

As we asked them about interacting with GWR via our prototype, 11 people, just over half of the sample, and significantly, nine women and only two men, commented on entering competitions and in particular voting. They reiterated their current barriers relating to cost, phone queues and not wanting to hear their own voice on the radio. The immediacy of voting (and feedback probably) could make this type of simple interaction highly attractive: *“I probably would if it was something really like handy --- if it said just click here and enter, then I would, sometimes they get the polls on and you just got to click and submit, --- so much easier, I would be more inclined to enter.”*

We asked interviewees what else they would like to see on the device, how they envisage a product like our prototype would look like and how they would use it. We were helped here by the fact that the interface is very easy to use: *“It is easy to use, especially if you have used the internet before.”*

In addition to expressing the wish to buy music or order tickets for the cinema, or take part in competitions, there were suggestions to add traffic alerts, TV-information, horoscopes, little games, a picture of the presenter(s), a web-cam, a diary, music, email capabilities, stock quotes, useful adverts etc. In addition there were some comments about personalization, e.g. music or adverts that you are interested in: *“One thing that I think sometimes with adverts and everything, they play ads, well actually, the majority of times you may tune out and switch off from an ad, sometimes you listen to an ad and you get to the end of it and you think hang on that was actually quite applicable, I*

actually like to hear that again, or I actually like to hear more detail. So if it gave you the option to say playback this ad again. And you could pick that ad, or save the ad, or text, so if you stop off later, phone up.”

The extra information, however, has to be lightweight and should not interfere with the enjoyment of listening: *“If you want any information from it, you have to continually interact and I’m not that interested in interacting all the time with it. I just prefer music to be played and I prefer just to listen to it as opposed to constantly have to do things, stuff to get something from it. I would just use it as a tool for a bit of news and just interest to show me on the screen what is playing.”*

In addition it has to be integrated in the car: *“If it can work the way car radio works. If you can buy an extra holder for you car, it could be your SatNav, your radio, and an MP3 player. It could be your whole one-stop-shop.”*

The mobile phone was indeed an obvious candidate to implement DAB radio. Even though interviewees realized that the smaller screen might pose problems, it would have the advantage of taking it with you when going out: *“If I’m out with friends and they want to go to the cinema, they can look it up on this. Most people will carry their phone with them.”* But there was also a feeling that having the radio on the phone would somehow be incompatible with the phone’s main function of talking and listening to other people. In addition they worry about battery life.

Inevitably there are comments about the all-in-one device, about converging media: phone, radio, PDA. In this manner, regularly the topics of iPod and iTunes come up: *“It has to work with iTunes. Maybe you can have an account on the GWR web site with a record of the tunes you have bought.”*

4. DISCUSSION

In this paper we report back on an interview study, where we asked people about their radio listening habits and what radio means to them. We presented to our interviewees a mobile prototype that combines local radio broadcast, GWR-Bristol with visual information and we asked them for feedback. Through the interviews we built up a vivid, rich and consistent picture of how deeply radio listening is embedded into people’s lives.

Our interviewees rely heavily on being able to routinely switch the radio on; in particular first thing in the morning. Radio is typically listened to whilst people are busy with other things. Our prototype displays visual data accompanying the radio broadcast. *Why should people want to look at their radio?* The house is full of radio appliances, quite regularly people move around the house whilst listening to the radio and switch a number of fixed radios in different rooms on and off and on as they move from room to room or leaving it on even when there is no one else but the dog.. Outside of the car radio there is very little mobile radio listening. *Are there “visual” opportunities for mobile radio appliances?*

During the breakfast show, the intensity of the radio listening experience as well as the community aspects are at its peak, personified by the local presenters. People identify with presenters. Hearing about local events and traffic information further emphasizes being part of the community, the people of Bristol. All in all, it provides energy to start the day, a sense of

belonging, as well as topics of conversation for later in the day. This community feeling is continued when they take their car into work on their daily commute. Individuals in their soundproof bubble sing along; even being noticed by other car drivers does not seem to deter nor embarrass them. They hate the quiet, there is an urge to switch that radio on. The commute home sees some sort of a return of radio-excitement, but now music and information, for most, are more important than the chat of the presenters and the adverts annoy them more. Cooking the evening meal is accompanied by radio listening, but community related comments are scarce. Often people put on CD's whilst cooking. Evenings are more associated with watching TV than listening to the radio but a few fall asleep with the radio; and there could well be a community element here: feeling safe.

The "For-Anyone-as-Someone" communicative structure [11] describes that sense of community feel that GWR morning show listeners experience. It relates to the interviewee, who, whilst driving her car and listening to the radio, sees others in their car laugh and sing in response to the same radio program, or to the "water cooler" conversations later in the day:

"Thus I find, when I turn on the news, that I am spoken to while knowing that millions of others are watching at exactly the same time and seeing and hearing exactly the same things. --- It is thus an experience that I share with others and as such is, in principle and in fact, talkable-about by me with anyone else who has watched the same program. --- express a public shared and sociable world-in-common between human beings." [11]

Scannel makes the point that radio is timetabled, it is happening now for everyone:

"One of the most obvious and overlooked aspects of broadcasting is that it runs a timetable. --- Each one of us knows that just as it speaks to me it speaks to millions of others at the same time, now"

The hard to describe excitement of a live broadcast football match, where from millisecond to millisecond we have no idea how the match is going to pan out (very different from seeing the repeated highlights), is woven into the argument, as follows:

"This now of concern is doubled, and it is this doubled spaciality and temporality that yields the specific for-anyone-as-someone structure of daily media as a new kind of available now. There is the now of the broadcast event and at the same time the now of listening. Each of these nows is distinct (each has a different location) --- the soccer stadium and the now of listening is always elsewhere, in the car, the home or wherever. But the broadcast now is for the situated now of reception. The broadcast now gathers us - in millions - into a shared now of concern."

Interacting with the radio station in all the different forms that we have described, takes the community feel to the level of participation, well beyond the "For-Anyone-as-Someone" communicative structure. Simple interaction via the visual radio's interface could overcome the current barriers associated with phoning in and texting, i.e. no more cues, quicker and cheaper and with instant feedback how the rest of the community has voted. In addition it might open up commercial exploitation, e.g. selling MP3's. The presenters, the culture workers as Ahlqvist [1] calls

them, instigating and reinforcing the community feel of the morning show, also play an important role, as "mediators" between the music producers on one side and the audience on the other. All the banter and chat might well produce a well-oiled conduit for (newly produced) music to be heard *and* sold:

"Other researchers have applied an interpretive perspective by studying culture producers as mediators between culture creators and receivers --- 'mediator' is conceptually preferable to the 'gatekeeper' metaphor commonly used in production models because it draws attention to the fact that these culture workers are not merely 'selecting, sorting, and ordering a vast quantity of "raw materials" which then flow through the system . . . to the public', but are constructing cultural objects by drawing on particular interpretive knowledge frameworks. Mediators are seen as analytically important because they highlight the role of culture workers as simultaneous producers and consumers (interpreters) of cultural objects." [1]

In an earlier study we found that most people become aware of music, which they end up buying (or at least owning), via such mediators, through the direct experience of listening (radio, TV) rather than indirectly via reading or hearing about it in reviews [6]. Enhancing radio broadcast with data, such as the last ten songs played, combines the direct experience of listening to a song, whilst it is broadcast, with simple information about who is playing and how to download the tune. Thus with the rise of iTunes [7] this might benefit providers of MP3 download services.

The car is a radio (and music [2]) listening booth par excellence. It is there for lightweight company (music and chat). The community feel is continued with local news and traffic information. Most interviewees listen to the radio whilst travelling to work and they tend to stick to one station. Those who travel more extensively during the week or in the weekend, mention how they go from one local radio station (GWR) to another. In other words they have a (location based) mental map of where local radio stations are. Some participants mention their Nokia phone with FM radio which they use on busses or whilst walking to the corner shop. There are one or two people who use a dedicated mobile radio but its use seems negligible.

Our sample consists by and large of "ordinary" Bristolians, who do not perceive themselves as technology savvy. However, it is good to realise that these days certain technologies are so mainstream, ubiquitous and pervasive, routinely used in mundane situations that they are not perceived as "technologies" per se. The mobile phone is the obvious example, but we didn't expect that some interviewees would routinely use their mobile phone to listen to FM radio and talk about it in such a matter of fact manner. Also, the internet, which invariably involves tedious booting up of computers, is used routinely for checking the five day weather forecast, which films are on, listening to the radio, "Googling" away, finding out about any and every topic under the sun, downloading MP3's, etc. GPS under the name of SatNav has very quickly made its way into their every day vocabulary. On the entertainment appliance side several participants have more than one DVD-player in their house (with built-in radio), listen to radio on their cable or satellite TV and use presets on their car radios (although some females still have problems setting that up). They

are familiar with MP3's, iPods (although these are still perceived as too expensive, which only shows that they *are* familiar with the product) and iTunes. All in all, this general awareness of available technologies and familiarity with them means that certain technology perception hurdles of the past have now been taken.

In spite of the success of DAB in the UK, most subjects had not encountered DAB before and reactions to seeing the DLS were positive, possibly because of the novelty value. People liked seeing what is playing now and which songs are coming up. It would even keep them tuned in longer and wait for the adverts to finish. Few noticed that the audio quality was better, most likely because this is not of a high concern for the majority of users.

When the participants started to explore the "Radio Plus" button, we got a glimpse of how useful an instant website, a mini website as one participant called it, with short, everyday but highly useful, information, which comes to you, effortlessly and for free, as part of radio broadcast, actually could be.

There were many comments about how and why they currently find out about the weather, highlighting how the weather (in the U.K.) is both trivial and all important. For the weather they listen to the radio, although you have to tune in at a particular time, watch the morning news on TV and they look up the five day weather forecast on the internet, where you are not bound to particular timeslots, although it often does mean starting up the computer. In spite of the fact that people already have their daily routines to find out about the weather, the prototype sparked off enthusiastic exclamations and they were quick to point out how useful they found this (location based) information.

The "what's on" section was also a big hit. In addition to knowing where and at what time a movie is shown, a way to order cinema tickets via the device could be very useful. It would provide an opportunity to convert impulses to buy that otherwise might be lost. [9].

The advantage of accessing local information via the prototype follows a similar pattern. Some participants also mention how a product like our prototype might link up with the satellite navigation system in the car. As people travel around they would like to know what is on other local areas, including traffic information.

Seeing the last ten songs that GWR had played seemed to address a common frustration: You switch the radio on and you hear a (new) song that you like but you have missed what the song is called or who the artist was. Such a service would open up possibilities for ordering a song or an album, via the GWR interface or download a song as an MP3 (the return of the single).

As far as future product form factors are concerned, integrating DAB into the mobile phone seems promising. It would have the advantage of taking it with you when going out. Inevitably there are comments about the all-in-one device, about converging media: phone, radio, and PDA. In this manner the topics of iPod and iTunes come up.

Elaborating on how and when they would use an appliance like our prototype, we asked people when they have a bit of idle time

and how (if at all) they would use such a visual radio during that "gap" time. There is a range of times, places, mobile and non-mobile, situations. In the evenings, when not watching TV or after dinner are mentioned regularly but also when the baby is asleep in the day time or simply when bored. Places in and around the home such as in the garden or when tidying the bedroom come up. Mobile situations with longer gaps are mentioned: On a bus, waiting at the bus-stop, long coach or train journeys, on a plane, walking to work, whilst shopping with their partner (a male comment of course) and on the beach.

So, now we have heard twenty local radio listeners talk about their radio habits, how it fits into their lifestyles, what type of radios they have, where and when they listen and what they like and not like listening to *and* we have gauged their reactions to the prototype. What are the opportunities for adding a slightly bigger screen with more information to a DAB radio, how would (location related) information be of benefit to them, or most importantly, to the millions of local radio listeners out there in the world? What would a successful product look like? What kind of functionalities would a product range require?

Let's first consider **where** they listen currently.

At **home**, there are a great number of dedicated radios or appliances with a built in radio, e.g. alarm clocks, the stereo, the DVD player, the digital TV. These are located all through the house and, as people move about in their homes, they are in the habit of switching radios off and on, as required; they *do not* carry mobile radios with them in the house. It is also in the home that they listen out for local information and interact with the radio broadcast.

At **work**, the radio might be on for all to listen to, or they might log on to the Internet and listen privately via headphones. In the first case, radio broadcast is there mainly as background and spreads widely through the workplace. Adding a small screen (with a small visual reach in the foreground of our attention) to such a radio seems incongruous with the far-reaching audio in the background. It would probably be no more than a nicety and the impact of adding a screen seems minimal. In the second case of people listening to radio on the Internet via headphones, they already have a much larger screen and all the information in the world on tap.

If there is one place where all our interviewees listen to the radio, it is in the **car**; mainly during the commute into work and back home again, sometimes on longer work related trips as well as in the weekend. Whatever the opportunities are for adding visual information, it is obvious that drivers will spend most of their time looking at the road and not at a little screen.

Very few of the interviewees mention using a dedicated mobile radio, significantly there are a couple who say that they have one, but cannot remember where it is. The **mobile phone** however is used for listening to the radio already and people comment how much easier it is to take the phone than to take a portable CD player.

Thus, there are opportunities for adding a screen to the radio at home, all the more since battery life is of low concern, and in the

car, although the latter needs to be carefully designed, possibly integrating satellite navigation. Good immediate candidates are mobile phones and MP3 players. We can easily imagine how the phone screen could display simple information and how an iPod could feature a radio in the near future. Currently the use of mobile radio is limited but, since adding visual radio to a mobile phone or MP3 player is feasible, these are serious candidates; all the more since DAB would provide the quickest wireless internet currently available. The workplace, on the other hand, does not seem to offer good opportunities.

Let's now shift our focus to the **content** of the visual **information**.

People liked the DLS text and we can easily imagine that in near-future product roll outs there will be DAB radios with slightly bigger monochrome screens to accommodate 128 characters of non-scrolling (rather than the currently scrolling) text. Our prototype featured a GWR-branded mini-web site. This proved to be a big hit with the interviewees.

Simple, lightweight, "at a glance" information that is not necessarily linked to the content of the ongoing radio broadcast, such as the five day weather forecast, information on local events, films, local news and local adverts, that has the advantage of "coming" to you as part of the broadcast, instantly, wirelessly, rather than requiring lengthy booting up, has all the hallmarks of high user values. Information that has a more direct link to the actual broadcast, such as the last ten songs played, or some information on the artist (e.g. when is the artist coming to Bristol?) might enhance the radio listening experience further.

Finally there are some good possibilities for **interaction**.

The red interaction button on the remote control for UK's digital TV is slowly lowering barriers for interactivity, i.e. you vote on the same appliance as you watch the show; you do not need to switch to a telephone (to ring or to text) or a computer. Such a simple bit of interactivity might have profound and commercial implications. For instance, in the high street currently only about 5% of bookmakers' customers are women, but with interactive TV this is predicted to jump to 20-30% [8]. Visual radio too, could feature an interaction button for simple voting, opinion polls and quizzes. Good and timely feedback would contribute to making the whole interaction experience a satisfactory one.

Interviewees said that, not only do they want to check the films, the cinemas and the show times but they also expressed the wish to book their tickets via the appliance.

The success of iTunes could point the way forward to downloading music on the visual radio device. Here the car might offer good opportunities, e.g. in the same vein as people put CD's on when they want a change from the radio, people could download tunes, e.g. when stationary at the services.

We conclude that this study clearly highlights user values of what a visual DAB radio such as our prototype might provide and there could be some commercial advantages to this.

Audio: First and foremost the radio provides an audio channel, to be listened to mostly in the background.

A branded mini-web at a glance: The DLS provides simple, glance-able, lightweight but important information. By adding richer data, at the push of a button and still part of the broadcast, simple web-based information comes to you, carrying the (GWR) brand.

Interaction: There is potentially a powerful opportunity to interact, e.g. to download a sample MP3, answer a simple opinion poll, vote for a song etc. The interaction becomes more complicated when financial transactions are involved, e.g. to order an album, order a cinema ticket, or pay for MP3 downloads, but there are still some good opportunities to convert otherwise lost impulses.

GWR's morning slot = Local community feel: The deep emotions evoked by the morning show can be capitalised on to draw the audience in. Of course, for different radio stations such a slot might be at a different time during the day.

Home: A good deal of the audience starts listening when waking up and continue to listen whilst rushing about and getting ready. In spite of the rush, some find the time to phone up or text, whilst others merely shout the answers at their radio. Thus quick interaction with DAB radio offers the opportunity to act upon the call to action from the presenters (and in some cases advertisers), even though the "gaps" in people's life are minimal. People also use their digital TV to listen to DAB. The set-top box might be a good candidate to provide DLS and possibly other visuals as part of DAB in future.

Car: In spite of the obvious barriers to interact with the radio station or follow impulses to buy whilst driving, there are opportunities to somehow integrate satellite navigation systems with the radio based information services. When people make longer trips there are good possibilities for tapping into other local information or even take advantage of a break at the services to download some MP3's.

Mobile: Mobile radio listening is currently not a big factor. However MP3 mobile listening is widespread. Adding DAB capabilities to MP3 players, in particular, adding visual located information might have a (positive) disruptive effect.

Next user research steps: We are planning a field trial for February 2005, where prototype DAB visual radio units with some interaction capability are placed in households for the duration of a week.

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Columns on Last Page Should Be Made As Close As Possible to Equal Length